Kermavnar J, Kutnar L, Pintar AM (2023). **Ecological factors affecting the recent decline in Slovenia: the importance of bedrock type and forest naturalness**
iForest – Biogeosciences and Forestry – doi: 10.3832/ifor4168-016

Supplementary Material

Fig. S1 - Correlation matrix for five numerical predictors of spruce decline: potential evapotranspiration – PET (mm), soil clay content in 0-100 cm depth – CLAY (g/kg), STOROC – stoniness/rockiness (%), HLI – heat load index, SPRUCE10 – proportion of spruce growing stock in year 2010 (%). Raw, untransformed data are displayed (n = 6,355).

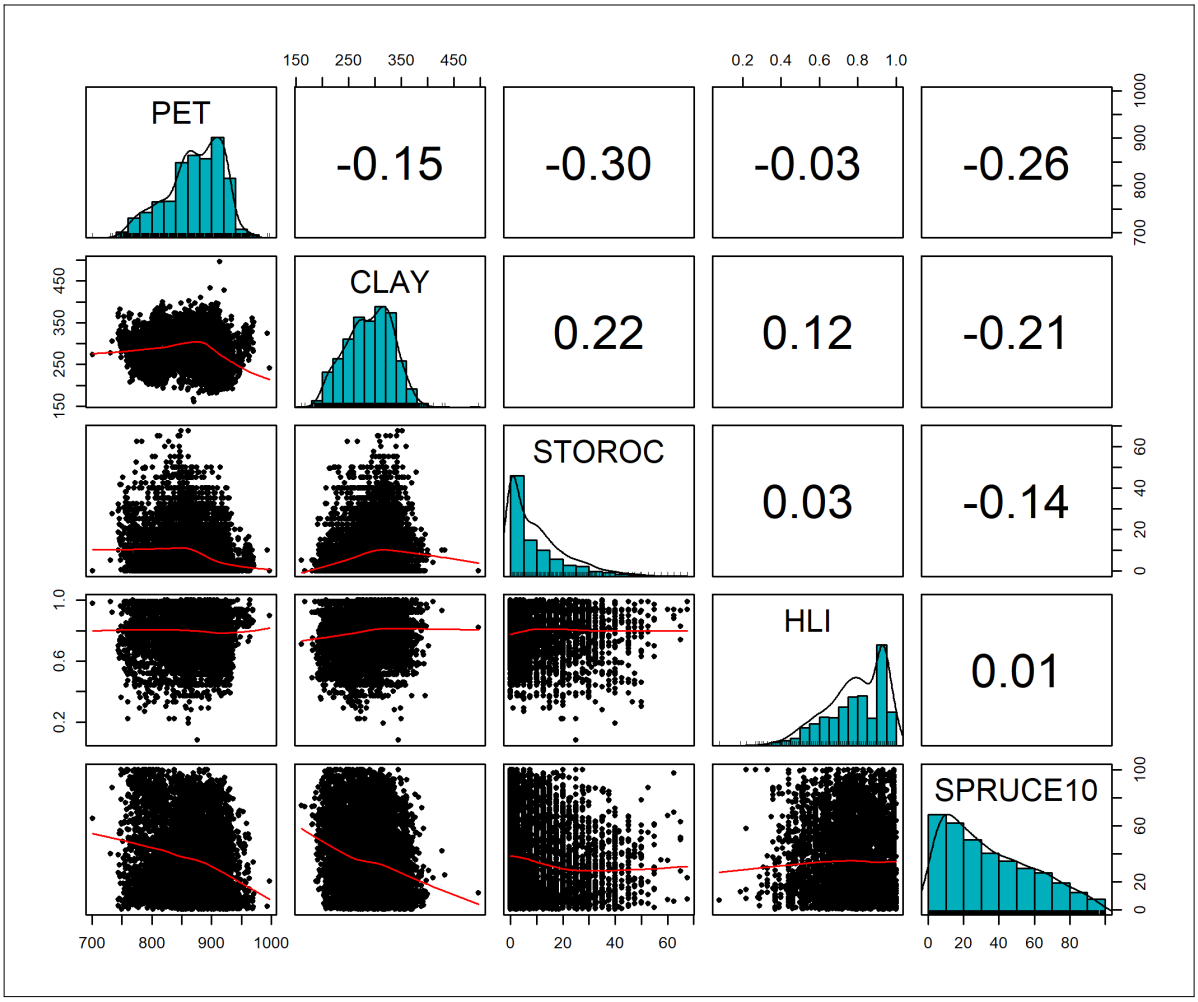

Fig. S2 - Quantitative predictors in the subset 1 (compartments with spruce decline > 10%, n = 6,355) per bedrock type categories: carbonate (green), mixed (blue) and silicate (red). Different letters above each boxplot signify statistically significant ($p < 0.05$) differences according to the non-parametric Kruskal-Wallis test.

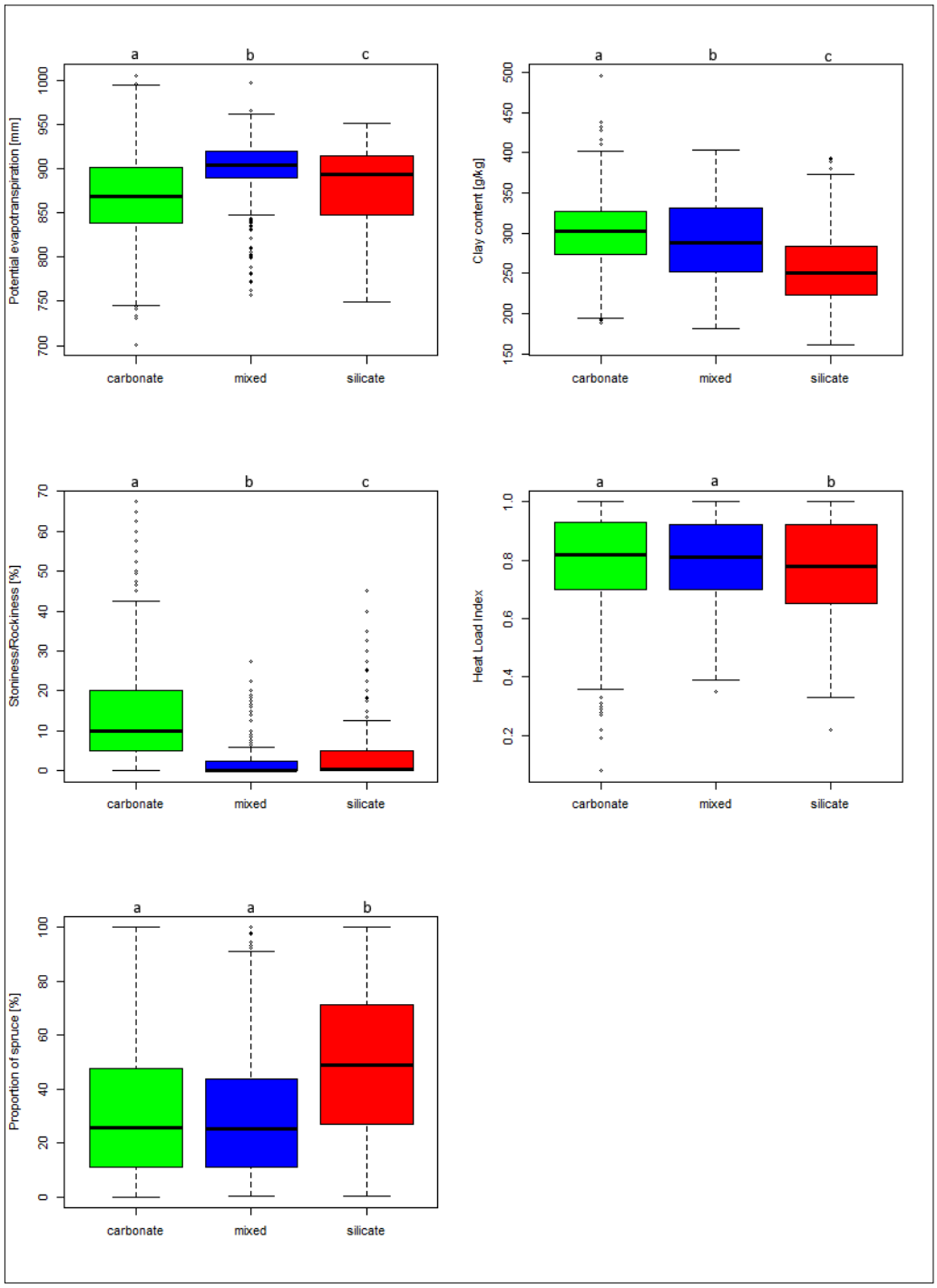

Fig. S3 - Quantitative predictors in the subset 1 (compartments with spruce decline > 10%, n = 6,355) per classes of tree species composition preservation: preserved (gold), changed (pink), strongly changed (grey) and altered (brown). Different letters above each boxplot signify statistically significant differences ($p < 0.05$) according to the non-parametric Kruskal-Wallis test.

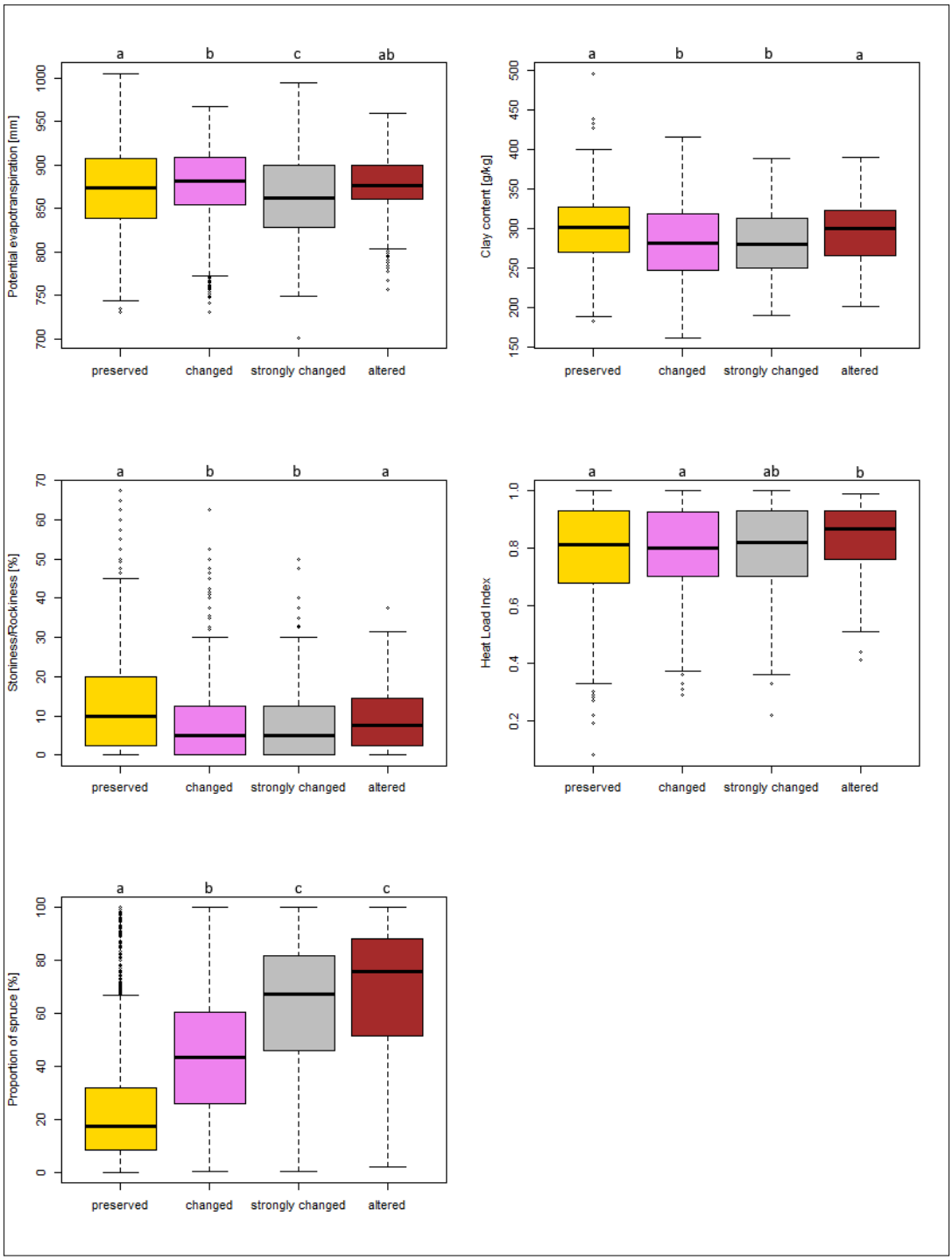

Fig. S4 - Relative number of forest compartments for different a) bedrock type categories (carbonate, mixed, silicate) and b) tree species composition preservation classes (preserved, changed, strongly changed, altered). Subset 1 – compartments with relative spruce decline > 10% (n = 6,355), subset 2 – compartments with relative spruce decline < 10% (n = 4,396).

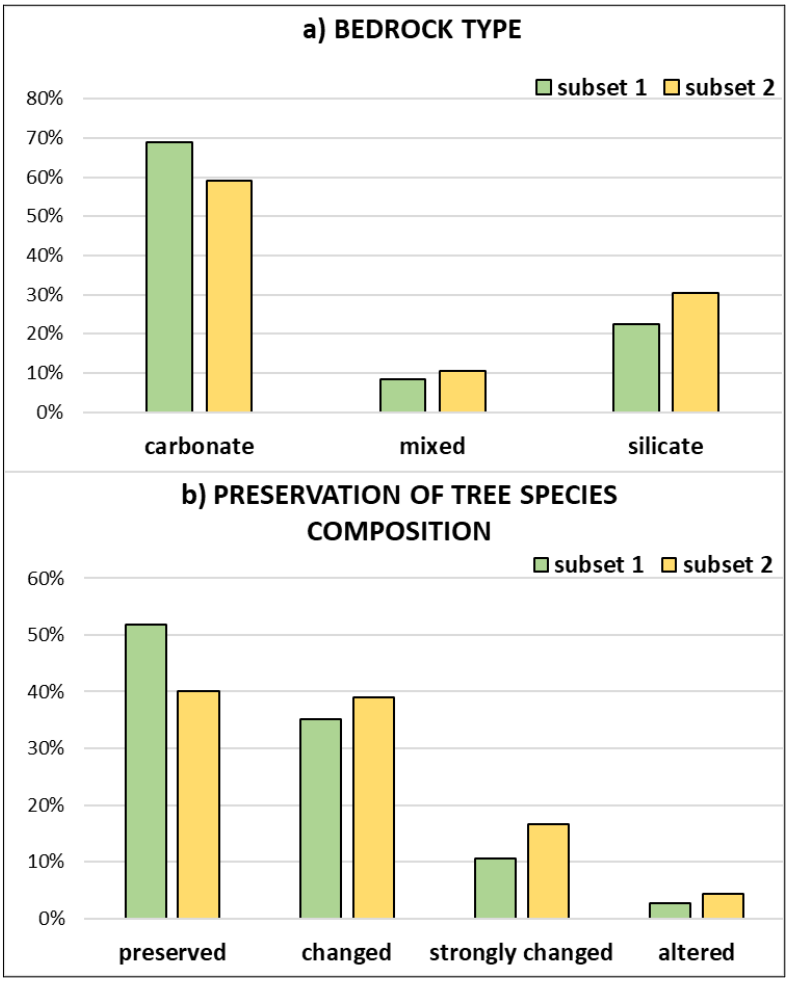

Fig. S5 - Estimated response of the absolute spruce decline (m^3) to selected predictors modelled with Generalized Additive Models: PET – potential evapotranspiration, CLAY – clay content in the soil depth 0-100 cm, STOROC – stoniness/rockiness, HLI – Heat Load Index and SPRUCE10 – proportion of spruce in the growing stock in year 2010. Bedrock type was included in each model as a categorical predictor: left column is for carbonate bedrock, middle column for mixed bedrock and right column for silicate bedrock. Blue ribbon around each curve denotes 95% confidence interval. F-value along with accompanying statistical significance (significant results in bold; *** $p < 0.001$, * $p < 0.05$) of smooth terms is reported at the top of each panel.

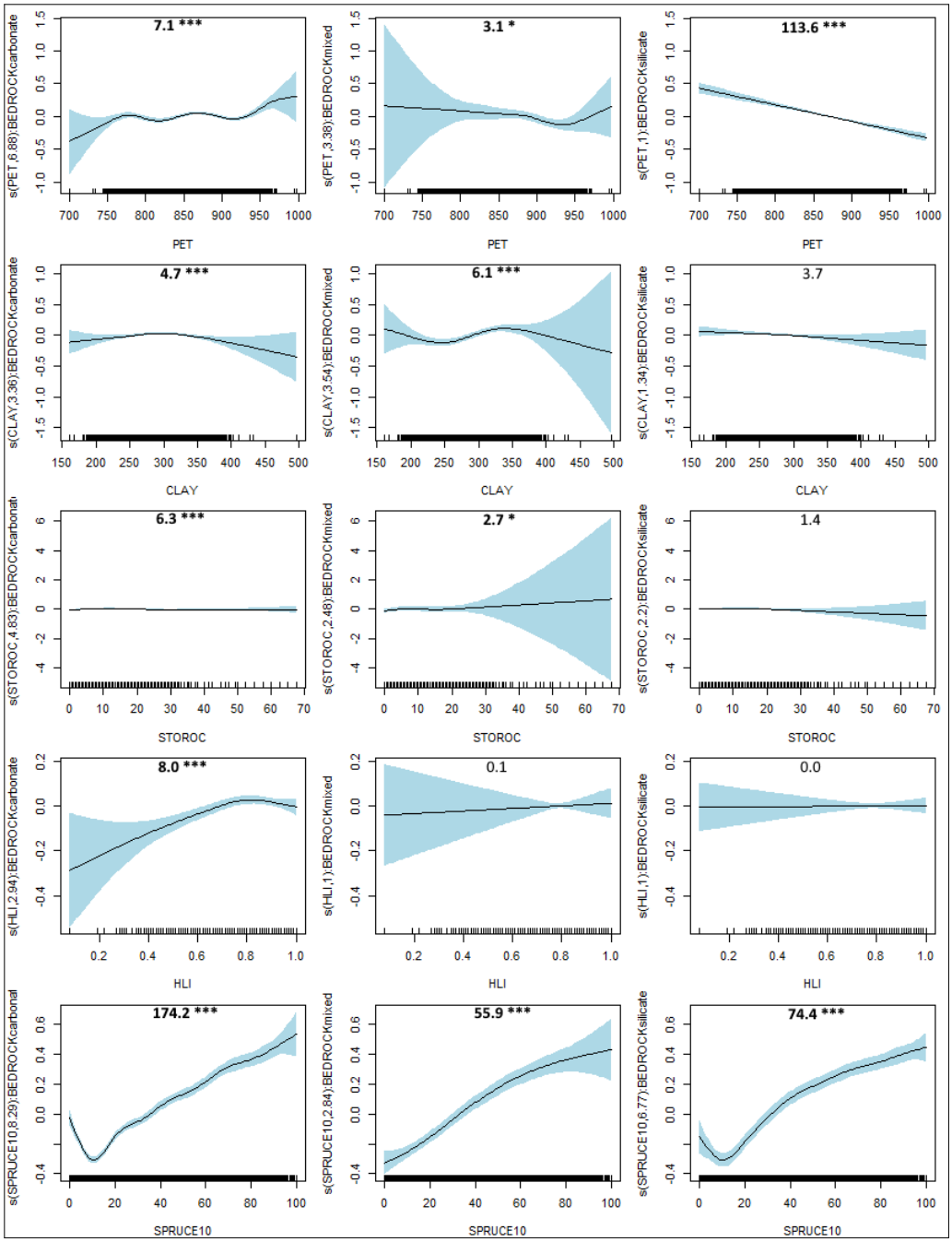

Fig. S6 - Estimated response of the absolute spruce decline (m^3) to selected predictors modelled with Generalized Additive Models: PET – potential evapotranspiration, CLAY – clay content in the soil depth 0-100 cm, STOROC – stoniness/rockiness, HLI – Heat Load Index and SPRUCE10 – proportion of spruce in the growing stock in year 2010. Degree of tree species composition preservation was included in each model as a categorical predictor: first column is for compartments with preserved composition, second column for compartments with changed composition, third column for compartments with strongly changed composition and fourth column for compartments with altered tree species composition. Blue ribbon around each curve denotes 95% confidence interval. F-value along with accompanying statistical significance (significant results in bold; *** $p < 0.001$, * $p < 0.05$) of smooth terms is reported at the top of each panel.